FRIM Technical Information Handbook No.28

Guidelines for

Control of Exposure to Hazardous Wood Preservatives

in the Wood Processing Industry

FOREST RESEARCH INSTITUTE MALAYSIA

In cooperation with

DEPARTMENT OF OCCUPATIONAL SAFETY & HEALTH

1999

FRIM Technical Information Handbook No. 28

Guidelines on

Control of Exposure to Hazardous Wood Preservatives

in the Wood Processing Industry

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(Editor)

1999
Second edition

FRIM
ISBN: 983-9592-98-X

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Desktop Publishing by: Birdman Creative Services
Printing by: Percetakan Mega Sdn. Bhd.

Acknowledgements

This guideline is the result of joint efforts of the Forest Products Technology Division, Forest Research Institute of Malaysia (FRIM); the Division of Industrial Health, Department of Occupational Safety and Health (DOSH); and officials and members of the wood processing industry organizations in Malaysia.

The work and publication has received financial and technical support from the Danish Cooperation on Environment and Development (DANCED) as part of the ENWIND (**En**vironmental Improvements in the **W**ood Processing **Ind**ustry) Project undertaken by FRIM on behalf of The Government of Malaysia.

The following chemical suppliers assisted with information on wood preservatives: Celcure Chemicals (M) Sdn. Bhd., Fernz Timber Protection (M) Sdn. Bhd., Protim Solignum Sdn. Bhd. and Koppers-Hickson Timber Protection (M) Sdn. Bhd. Members of The Malaysian Wood Preservers' Association (MWPA) also provided useful comments to the draft guidelines.

FRIM would like to thank the following persons who have contributed to the preparation of the wood preservative guideline:

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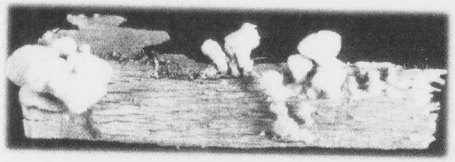
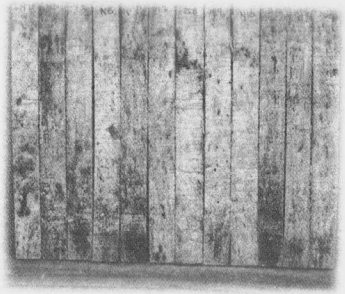
Contents

Without the use of suitable wood preservatives a host of fungi, beetles and termites cause damage of commercial timbers



Attack by decay fungus

Attack by wood-boring beetles



Attack by sapstain and mould fungi

Termite attack

However these wood preservatives can pose serious occupational health and safety risks if not handled wisely

1. Introduction

The wood processing industry has always been a major economic activity in Malaysia, employing close to 250,000 workers in 1995. This implies that a significant proportion of the work force in the country are potentially exposed to occupational health and safety risks related to wood processing activities. For example, a large population of the employees are exposed to high levels of organic vapours containing light organic solvent-borne preservatives or creosote, and water-borne wood preservatives as control measures and personal protective equipment are not adequate.

Wood preservatives are hazardous chemicals containing specific active ingredients (chemical compounds) together with inactive chemicals and mixed either with water or organic solvents. They should be treated with extreme caution, and humans should be prevented from inhaling, swallowing or having skin contact with them. They are applied to the wood in a number of ways (see Section 5.5.2 for details of wood preservation processes) implying different risk levels of exposure through skin, lungs or stomach. There are about five different wood treatment processes in Malaysia. Processes should be carefully selected to imply the lowest risk. Generally, the more manual the treatment process, the higher the risk of dangerous exposure to the treatment plant operator.

A list of wood treatment companies in Malaysia are available from the latest official publication, entitled: Directory of timber trade in Malaysia 97/98. 13th edition, published by The Malaysian Timber Industry Board. A list of manufacturers and suppliers of wood preservatives is provided in Section 5.6. A list of registered wood preservatives (or preservatives currently seeking registration) in Malaysia is shown in Section 5.7.

Dipping wood manually into a dipping tank, or by spraying, involves the highest risk of direct contact with the preservatives and should be avoided entirely. You may in the short term introduce a hoist or use a fork lift truck to dip the wood into the tank, or even adopt automated spray systems. Working manually with freshly preserved wood also represents a high risk, as splinters of wood can penetrate the skin causing direct access of the chemical to the blood.

However, when conducting a risk assessment of a wood preservation process one must also take into account the larger quantities of hazardous substances often involved in mechanised or automated processes (see Section 5.4).

The risk of inhaling the chemicals differs according to the properties of the substance and the working procedure. Vapours of organic solvents should always be removed from the breathing zone. Also, mists can be formed by the vacuum-pressure treatment processes, and it is advisable to have extraction at the opening of pressure treatment vessels as well as to have the worker wait a while before removing freshly treated wood from the pressure vessel. Full protective equipment is generally needed to protect workers who go inside pressure tanks for cleaning or maintenance.

The guidelines are written specifically for wood preservation companies, mainly those in the small and medium scale industries (SMI's). The guidelines aims at providing factory owners and managers with guidance on practical ways of reducing the exposure to hazardous substances used by the wood treatment industry such as organic solvents and wood preservatives as much as possible within the present technical and economic possibilities of the industry. These wood preservatives are hazardous to plants and other organisms. However, if these substances contaminate the wood processor (e.g. labourer, wood machinist, preservative treatment operator), the consequences to his/her health can be extremely serious. At present there are no permissible exposure limits (PEL´s) for chemical substances, let alone wood preservatives, in Malaysia. However, ACGIH (American Conference of Governmental Industrial Hygienists) limit values can serve as indications of PEL for these chemicals.

Despite the many chemical hazards at a wood preservation facility (factory), the majority can be avoided by careful plant design, operation and layout, the choice and amount of wood preservatives required, as well as by wearing suitable personal protection equipment. Therefore the emphasis of this guideline on control of exposure to hazardous wood preservatives is to **reduce chemical exposure at the source**, e.g. to either substitute solvents or treatment chemicals with less dangerous substances, or adopt safer wood treatment systems. Such measures should always have first priority. Remedies, which attempts to reduce the impact of chemicals on the individual shall only be considered an additional, second option. Such options include providing exhaust systems and personal protective equipment (respiratory protection, gloves, clothes).

The guidelines on control of exposure to wood preservatives are advisory by status, and intended to provide the wood preservation industry with the basic technical information and awareness required to make improvements in their occupational health and safety in the use of wood preservatives and organic solvents. The guidelines should be able to assist the wood preservation companies in complying with existing regulations of the Department of Occupational Safety and Health. It is recommended that the guidelines be consulted and applied along with the Occupational Health and Safety Act, 1994, including the Pesticides Act 1974 (administered by The Pesticides Board of Malaysia, Department of Agriculture). It is hoped the guidelines on exposure of wood preservatives will help the wood preservation industries improve health and safety precautions in their work environment in Malaysia.

Though this is the second edition of the guidelines, it is anticipated that periodic revisions will be conducted to accommodate changes in relevant occupational health and safety regulations, and possible withdrawal of existing, or introduction of novel, chemicals registered for use by the wood processing industry in Malaysia. The present guidelines also exclude treatment of panel products (e.g. plywood, fibreboards and chipboards) with fungicides or insecticides usually by the glue-line phase of production of panel boards because preservative treatment of panel products is practically non-existent in Malaysia at present. Therefore the chemical suppliers and the wood preservation industry are encouraged to provide comments to The Department of Occupational Health and Safety and The Forest Research Institute Malaysia, to make this document more comprehensive and cost-effective to the Malaysian wood preservation industry.

2. Summary of Health Risks and Remedies

Health hazards:

Wood preservatives

- Acute poisoning
- Dizziness, headache, fatigue, nausea
- Irritation of nose, throat and lungs
- Skin rashes and eczema
- Irritation and burning of eyes
- Sores can develop after prolonged effects on nose, throat, lungs, skin, and eyes
- Damages to the central nervous system causing loss of memory and psychological instability if exposed for a long period.
- Prolonged or high exposure can damage kidneys, liver, brain and nervous system
- Damage of foetus and reproduction ability
- Prolonged exposure can eventually cause cancer of kidneys, liver, brain and nervous system

Remedies:

Safety precautions for hazardous wood preservatives

- Consider options for using less hazardous chemicals (preservatives, organic solvents)
- Cleaner and better technology
- Adopt sound technical and engineering controls or improvements if the use of more hazardous chemicals cannot be avoided. (Isolate, exhaust and ventilate).
- Familiarity with relevant Materials Safety Data Sheets (MSDS)
- Personal hygiene and cleanliness
- Protective clothing and safety equipment
- Ability to administer first aid
- Good housekeeping
- Provide changing rooms, lockers and showers
- Strategic plant entry, changing and toilet facilities
- Provide emergency showers and eye-washing facilities
- Maintenance of protective clothing clothing/equipment
- Information, instruction, and training
- Regular medical check-up

3. Control of Exposure to Hazardous Wood Preservatives

To make working with hazardous chemicals as safe as possible, a number of general safety precautions can be taken. The aim of these should be stated in the company's Safety and Health policy, e.g.:

- to avoid any known health risk caused by exposure to chemicals
- to engage in a process of permanent exposure reduction
- to substitute hazardous chemicals with harmless or less hazardous ones whenever possible

3.1 General Safety and Health Precautions

The following are common-sense safety requirements in use of hazardous chemicals specified for two distinct categories of users, each of whom has quite distinct responsibilities for safety requirements regardless of the specific substance:

- Corporate: the company e.g. furniture manufacturers, wood-based panel manufacturers, chemical suppliers, wood preservation companies, saw millers and other wood processors (see Section 3.1.1).
- Direct users: workers and professionals (see Section 3.1.2).

Apart from these two categories of users, also factory builders, engineers, advisers etc. have a responsibility concerning safety features in the design and installations when the lay out of the production plant are decided, because this can affect the risk level directly or indirectly. The chemical suppliers are compelled to provide Material Safety Data Sheets (MSDS) pertaining to the chemical to their customers (purchasers of chemicals) and advise them on the safe use of their chemical products (see Section 3.1.4).

3.1.1 Corporate responsibilities

It is a legal and moral responsibility of any manager or supervisor that good industrial hygiene principles are followed when handling hazardous substances. As such, the company should have an active **health and safety committee** as well as a **written safety and health policy** (both are required by DOSH) to be implemented as a part of its management (see Section 5.2). The main principles of safety precautions in exposure to wood treatment chemicals are:

- Consider options for using safer preservatives and safer treatment processes (of applying these chemicals)
- Adopt sound technical and engineering controls or improvements if the use of hazardous chemicals cannot be avoided
- Give preference to the use of such controls or improvements instead of simply relying on the use of protective clothing and equipment

It is suggested to use some form of basic checklist for management of control of wood preservatives at the wood treatment facility or wood preservative manufacturing plant. An example of such a useful checklist is given in Section 5.8.

The general responsibilities of the managers and owners of companies are as follows:

3.1.1.1 Clarify responsibilities

It is good management practice for the health and safety committee to make responsibilities clear, as stated in its corporate safety and health policy. Clarify the respective responsibilities of employees and employers concerning housekeeping, storage, transport and handling, Material Safety Data Sheet-control (see Section 3.1. 1.3), and to avoid conflict of roles in the event of an emergency.

3.1.1.2 Substitution

Each time a hazardous substance is taken into use, it should be seriously considered if a less hazardous substance or method can be used instead.

3.1.1.3 Information

Make sure you are well informed about the specific hazards and safety precautions of the preservative chemicals used. The suppliers' information contained in the Material Safety Data Sheets (MSDS), also called Chemical Safety Data Sheet (CSDS), must be at hand. Keep it close to each working location and readily accessible to the workers. Make sure it is understood by your employees, and that they are properly trained in working safely with the chemical. Under the Occupational Safety and Health (Classification, Packaging and Labelling of hazardous chemicals) Regulation 1997, the chemical supplier is required to provide an MSDS to the purchaser of chemicals (see Section 3.1.4). Also this regulation states that chemical products must be suitably labelled on the packaging to contain information about the formulation, hazards, risks and safety precautions in handling the wood preservative, and the manufacturer and supplier of the chemical. Detailed standard specifications for labelling of wood preservatives can be found in the following authoritative publications:

- Malaysian Standards MS 683:1982. Labelling of dangerous substance. SIRIM.
- DOSH 1997. Guidelines for labelling of hazardous chemicals. Department of Occupational Safety and Health, Ministry of Human Resources, Malaysia.
- Pesticides Board 1991. Guidelines on registration and labelling of pesticides. 4th edition, Pesticides Board, Crop Protection Branch, Department of Agriculture, Ministry of Agriculture, Malaysia.

Know *the dangers and safety precautions of your chemicals: ensure that all wood preservative chemicals are properly labelled, and get an MSDS from your chemical supplier*

It is equally important for the in-house health and safety committee to control the suppliers' information. It may be practical to write the main points and the points particularly relevant to your company in plain language, possibly using symbols or signs and display it at the working area. If you employ foreign workers, it is particularly important that they understand and abide by the safety instructions. Make translations, if necessary. See also Section 3.1.4 concerning chemical supplier's responsibility to provide sufficient information to the wood treatment company.

3.1.1.4 Training

It is the responsibility of managers and supervisors of wood treatment plants to instil the virtues of good industrial hygiene principles on their employees. Train, as well as re-train, employees on the safe use of wood preservatives. Such training must be certified before an employee undertakes the task. The relevant national agencies associated with information and training on chemical safety, particularly The National Institute of Occupational Safety and Health Malaysia (NIOSH) and DOSH are shown in Section 5.9.

To train and re-train employees on the safe use of wood treatment chemicals, the following elements are incorporated:

- Safe work procedures
- Specific health hazards of the chemicals
- How to use MSDS (=CSDS) or manuals
- How to manage chemical spillage
- Awareness of symptoms of over-exposure to chemicals
- Protective clothing and equipment
- First aid
- Good hygiene practice
- How to report or record material defects and accidents

3.1.1.5 Ventilation

Provide suitable ventilation facilities e.g. mechanical extraction (if necessary with filters and scrubbers to control atmospheric discharge of toxic fumes). Make sure the ventilation reduces exposure to the atmosphere to below allowable levels [Use the standards (TLV's or PEL's) of the American Conference of Governmental Industrial Hygienists (ACGIH) in the absence of national standards]. The exhaust shall be discharged away from the working areas of the premise. Methods adopted for controlling emission of harmful vapours, fumes or dust must comply with DOE requirements.

3.1.1.6 Housekeeping

Good housekeeping is essential to safety. Avoid any spillage, leakage and make sure the place is properly cleaned, (e.g. hosing down wood preservative deposits into collection sumps for appropriate treatment or disposal). Avoid dry sweeping which churns up contaminated dust.

3.1.1.7 Storage of chemicals and fire prevention

To avoid fire risk from the storage of chemicals, they shall be placed in accordance with the fire regulations enforced by the local fire authorities. However, some fire prevention measures should be taken:

- Never smoke or do open fire near inflammable chemicals
- Store preservatives ventilated under roof away from sunlight and weather
- Keep the preservative containers labelled (see Section 3.1.4)
- Keep storage area locked
- Construct concrete floor and bund for storage area to collect spillage of chemicals
- Do not work with processes that can create sparks or very high temperatures (e.g. welding, metal grinding) near chemicals
- Buy and maintain fire extinguishers
- Avoid leakage/spillage of combustible solvents, and have suitable absorbent to mop up spillage
- Ensure plant operator is trained in fire fighting, and knowledge on suitable fire fighting media
- know the fire hazards or explosion hazards of various chemicals (consult MSDS)

Ask your chemical supplier for MSDS which should contain information on the above: **fire fighting measures**, **accidental release measures** and **handling and storage**.

3.1.1.8 Personal Protective Equipment (PPE)

Personal Protective Equipment is for exclusive personal use and should never be shared with a colleague. DOSH has a list of approved suppliers of PPE. Contact DOSH for this information.

It is recommended to double-check with suppliers of chemicals and PPE which equipment is best for the exact purpose.

- Full-length absorbent overalls must be worn to protect the skin against small splashes

- Wear water-proof/solvent-protective aprons when handling freshly treated wood

- Wear elbow-length protective gloves when handling chemicals or freshly treated wood.

  The choice of gloves depends on the chemicals and work procedures involved. Many water-resistant materials are penetrated by organic solvents in a short time. If possible, get a written statement from the supplier indicating the number of hours the gloves can resist the chemicals you are using. Always shift the gloves when their 'protection time' has run out. Protective gloves often cannot resist the wear and tear of handling wood. It may be necessary to use a combination of gloves.

- Wear safety shoes or boots when working in wet areas

- Wear safety glasses, goggles or a transparent shield whenever handling chemicals to protect the eyes from accidental splashes

- Wear a respirator when dealing with volatile chemicals, e.g. white spirits, creosote or certain Light Organic Solvent Preservative formulations.

  The choice of respirators also depends on the chemical exposure. Simple filter masks, scarves and respirators with the wrong filter cartridge do not protect against organic vapours. Filters/cartridges have a very limited life-span and must be replaced - as a rough rule every day in humid tropical climate.

WEAR

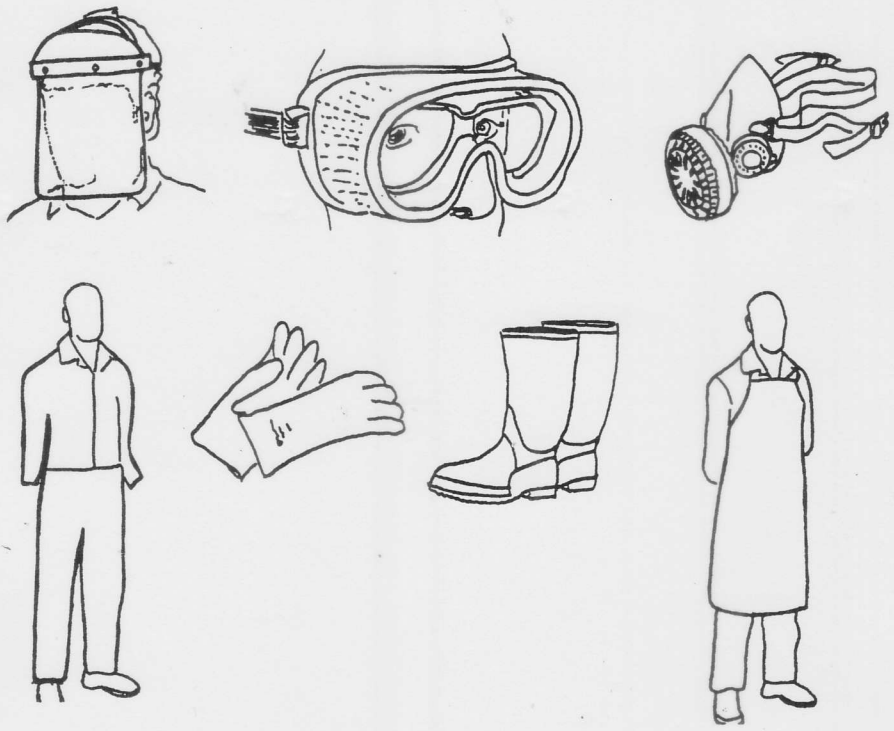
Eye protection

Protective gloves

It is reminded that personal protective equipment is for exclusive personal use and should not be shared with a colleague. One should therefore instill a personal discipline to maintain one's personal protective equipment. The following basic steps for such maintenance should be adopted:

- Wash overalls at least once a week but not at home
- Shift contaminated (wet) clothes immediately
- Avoid wearing torn or holed clothing
- Dispose of torn or worn-out gloves
- Dispose of gloves when their 'protection time' has passed
- Wash gloves thoroughly after each working day
- Rubber masks must be washed in warm water before storing in the locker
- Keep personal protective clothing and equipment safely in the locker

WEAR approved personal protective equipment



Inexpensive equipment for personal protection when handling wood preservatives to avoid bodily contamination of chemicals

3.1.1.9 Welfare and hygiene

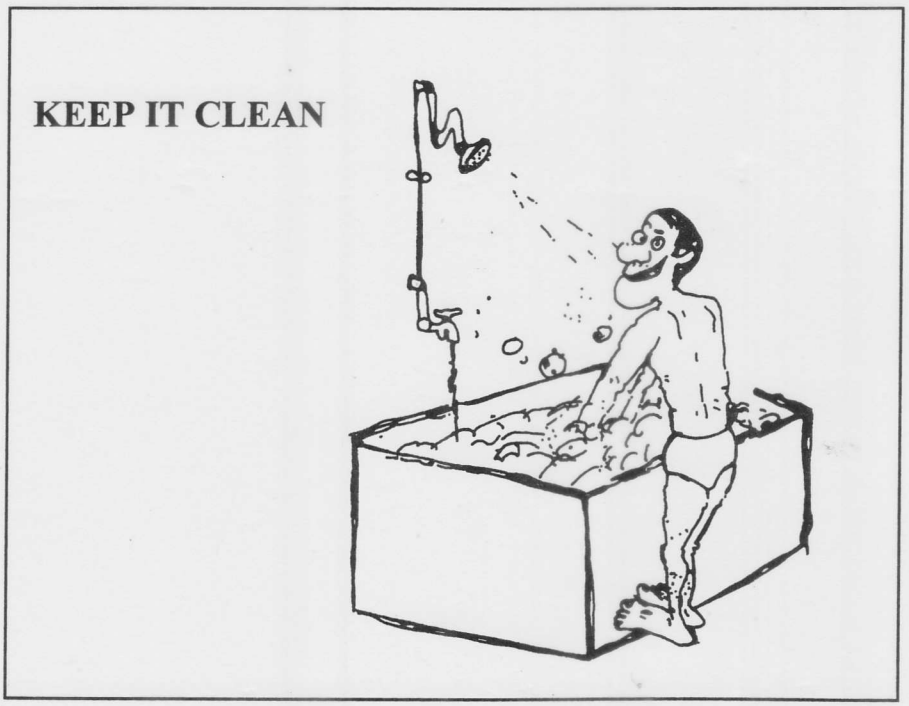
Provide changing rooms, shower facilities and personal lockers to ensure workers leave all their protective clothing and equipment in their personal lockers, and wash themselves or shower before eating, drinking, smoking or leaving the premise. Provide designated areas for eating and drinking, and other areas for smoking, free from chemical contamination.

3.1.1.10 Clothing

Provide adequate protective clothing and equipment. Ensure it is washed and workers check it regularly.

3.1.1.11 Medical check-up

Mandatory regular medical check-up for direct users working with - or close to - hazardous chemicals.



3.1.1.12 First aid

Provide emergency showers, wash basins and eye-washing facilities strategically located around the working area, with unhindered access to these locations. Train first-aid regularly and have access to a telephone in case of emergency.

Ensure there are sufficient qualified first aid personal among the employers and employees to render immediate assistance in the event of an accident involving hazardous chemicals. Always have a water tap, possibly an emergency shower and an eye-flusher close to the area where they are being used.

Emergency measures to be taken in the event of an accident due to exposure to chemicals are outlined in Section 3.1.3.

The summary first aid for exposure to water-borne preservatives is shown in Section 4.7.

The summary first aid for exposure to organic solvent preservatives is shown in Section 4.8

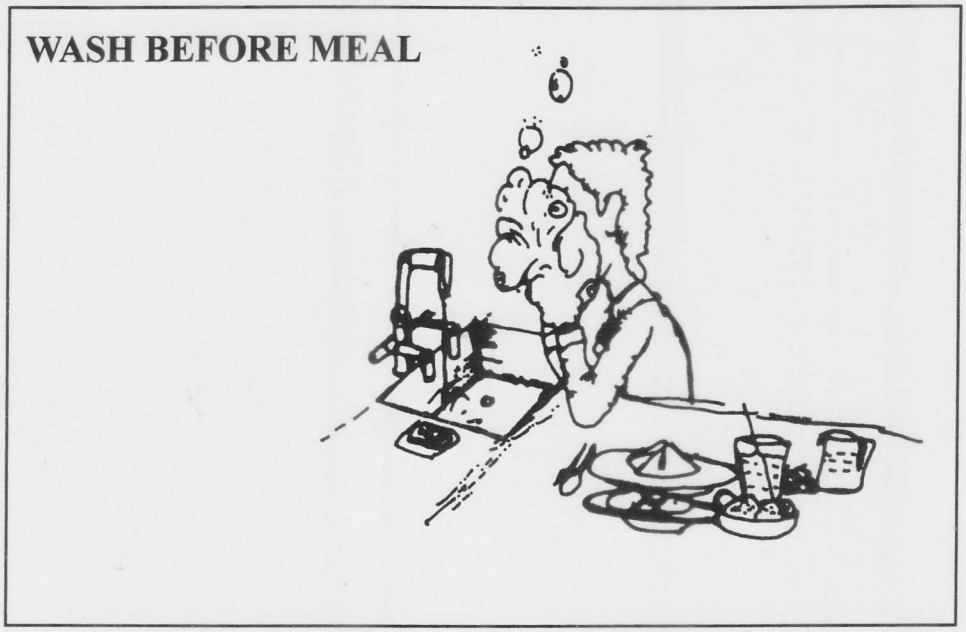
3.1.1.13 Factory lay out and design

Strategically lay out entrances to wood treatment plant or preservative storage plants in relation to changing rooms and toilet facilities. Such a design will encourage good hygiene practices by directing workers to leave or enter the wood preservative area via changing rooms linked to shower and toilet facilities.

Personal lockers are to be located in changing rooms. It is advisable to shower at the end of the day's work before leaving the premise.

At wood preservation plants using hazardous preservatives, a safety pit should be located centrally to offer workers quick and easy access. It must be designed to give high protection in case of emergency such as fire or a major outlet of toxic fumes.

A publication on guidelines for the design and operation of wood preservation facilities is being drafted in co-operation with DOSH and DOE, and is scheduled to be published by FRIM later in 1999. Further details of factory lay out and design are contained in this forthcoming guidelines.



3.1.2 Personal (direct user) safety responsibilities

- All workers must know which chemicals are being used, what the health hazards are, what special precautions are needed and what the early symptoms of exposure are
- Workers must be acquainted with the Material Safety Data Sheet (MSDS) from the supplier (see also Sections 3.1.1.3, 3.1.1.4 and 3.1.4).
- Avoid breathing in chemical vapours, or preservative mists. Use and maintain the safety devises provided, such as exhaust ventilation or fans (see also Sections 3.1.1.5 and 4.3)
- Use the personal protective equipment provided, such as goggles, respirators and clothing (see also Section 3.1.1.8)
- Avoid any skin contact with hazardous preservative solutions. If contaminated, wash all chemical contaminants from the skin immediately with soap and water, wash hands and face before eating, drinking or smoking (see also Section 3.1.3)
- Eat, drink and smoke only in designated areas of the premise away from the zone of treatment activity
- Report any mishaps, incidents, leakage, poor maintenance, lack of protective equipment, early symptoms of intoxication etc. to your supervisor, safety officer or manager.

Of relevance, DOSH is also drafting a regulation to compel direct users to apply their chemical products properly (in a safe manner) called the Occupational Safety and Health (Use & Standard of Exposure of Chemicals Hazardous to Health) USECHH regulation.

3.1.3 Emergency measures

In the event of a worker being affected by exposure to chemicals there are obvious immediate steps to take in administering first aid to a victim:

- For breathing of chemicals: remove victim to fresh air and loosen collars. Apply artificial respiration if victim is not breathing

- For skin contact or splashes: wash affected skin immediately with cold water and soap or special cleansers. Rub skin gently. Continue flushing with water as long as pain persists or corrosive chemicals are involved (at least 15 minutes). Use emergency shower or eye-flusher nearby if needed. Then seek medical attention

- For swallowing: seek medical attention immediately showing label if possible. Do not induce vomiting. Meanwhile drink plenty of water to aid diluting and drink the following amounts of paraffin oil: adults 200 ml; children 20-40 ml.

- Additional emergency advice: contact the following centres for immediate assistance:

  Pusat Racun Negara (National Poison Centre), Malaysia (located at Universiti Sains Malaysia, Pulau Pinang)
  Tel: 800-8099 toll-free, 04-657-0099
  Fax: 04-656-8417
  E-mail:prn8099@cs.usm.my

  Your nearest hospital
  Tel:_____ (24 hr emergency service)

  Your company-appointed doctor
  Tel:_____ (24 hr emergency service)

- For fire: Immediately use fire extinguishers for small fires. Never hose down flaming solvents with water. Alert the fire services department. Conduct orderly evacuation of personal away from the burning area. If victim suffers from burns to the skin, run affected skin in cold running water, bandage the wound and seek medical attention.

3.1.4 Chemical supplier responsibilities

The **Occupational Safety and Health (Clarification, Packaging and Labelling of Hazardous Chemicals) Regulations 1997**, stipulates that the chemical supplier is legally responsible to provide or disclose information on their chemical products to the purchaser as Material Safety Data Sheet (MSDS).

The CPL regulations 1997 apply to the supplier of hazardous chemicals such as wood preservatives for use at workplace. According to the CPL regulations, the supplier includes **a formulator, a manufacturer**, **an importer** or **a distributor** of wood preservative products.

The four major duties of a wood preservative supplier are:

- to classify the hazardous wood preservative and accompanying organic solvent (if it is a component of wood preservative solution)
- to supply hazardous wood preservative in proper packaging
- to label hazardous wood preservative
- to furnish an up-to-date Material Safety Data Sheet (MSDS=CSDS) for hazardous wood preservative

These requirements constitute the basic principles of **safety in the use of wood preservatives** and, if complied with, will prevent any untoward incident related to the use and handling of wood preservatives.

The MSDS contains relevant information such as the physical and chemical properties of the chemical formulation, toxicological data, and health and safety precautions when dealing with the product. The regulation stipulates that the chemical supplier is required to classify as well as exercise proper packaging and labelling of their chemical product. The purchaser therefore has a legal right to demand such information from the chemical supplier.

The procedure for **classification** of wood preservative product is described in detail in the following DOSH publication:

DOSH 1997. Guidelines for the Classification of Hazardous Chemicals. Department of Occupational Safety and Health, Ministry of Human Resources.

The procedure for **packaging** and **labelling** of hazardous wood preservative product is described in publications cited in Section 3.1.1.3.

Sample label for a wood preservative formulation

ABC PRESERVATIVE
active ingredient 65%
inert material 35%

RISIKO
>Sangat mudah terbakar
>Memudaratkan melalui penyedutan, jika bersentuhan dengan kulit dan jika ditelan

RISKS
>Highly flammable
>Harmful by inhalation, in contact with skin and if swallowed

KESELAMATAN
>Jauhkan daripada sumber pencucuhan-Dilarang merokok
>Elakkan daripada bersentuhan dengan mata
>Jangan buang ke dalam longkang
>Ambil langkah berjaga-jaga terhadap luahan statik

SAFETY
>Keep away from sources of ignition-No smoking
>Avoid contact with eyes
>Do not empty into drains
>Take precautionary measures against static discharges

PERUMUS: (Formulator) Syarikat Pelarut Organik Sdn. Bhd.
No. 1, Jalan Jelatek
55555 Petaling Jaya.
Tel: 03- 9876543 (24 jam)

PEMBEKAL: (Supplier) Syarikat Kimia Sdn. Bhd., Jalan Air Molek,
70000 Seremban.
Tel: 06-123456 atau 018-2345678

Common danger symbols used on labels of hazardous wood preservatives